APPLICATION NOTE

TSM101 IN S.M.P.S

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The TSM101 is a voltage and current controller providing a more integrated solution in Switching Mode Power Supply application versus common standard ICs solution, with more functions widely used in power control in a single IC.

This application note shows three basic configurations of the IC, to be used in the secondary side of any SMPS.

Functions described are precise secondary voltage regulation, current limiting with foldback function, window detector with output feedback to opto-coupler or power good signal to CPU.

1 - Voltage regulation and overcurrent control

One TSM101 is used to control each voltage output of the SMPS controlling current and voltage.

Figure 1a shows how to use TSM101 on a single output. Values are given for a 12V regulated output and 10A current limit.

Voltage regulation is achieved with R2/R1 resistor bridge comparing the voltage to TSM101 internal 1.24V voltage reference.

- Vout =1.24x(R1+R2)/R1=1.24x117/12=12.09V

The amplifier is driving on output pin 6 the opto-coupler or a post regulation power MOS.

The TSM101 can also be used just as a current and voltage supervisor, outside the regulation loop. Replacing R2 with higher value like 110KΩ, enables the TSM101 to detect overvoltage and overcurrent on the 12V output. Pin 6 output is then a power good signal. A pull up resistor on the output pin 6 may be needed.

Logic is : High - Power Ok, Low - Power failure.

Current limitation is controlled through R4/R3 resistor bridge. The threshold voltage corresponding to the drop voltage in the shunt resistor is given by R4 value.

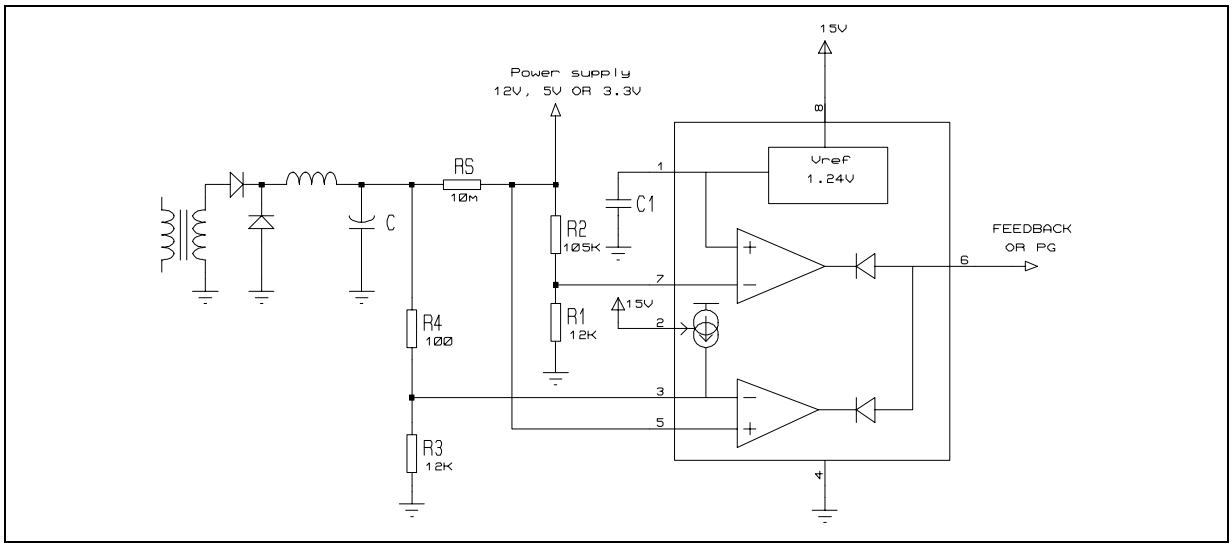
In Figure 1a example, 1KΩ = 1V, so 100Ω is 100mV.

- Vth=R3/R4 x Vout

We can see in this formula that the current limit level is linked to the output voltage level. This is the foldback function, when output voltage drops, current limit level drops in the same time, limiting destruction in the load defect.

If during start up, a higher current limit is needed, the figure 1b schematic brings a smart solution

Figure 1a : Voltage and Current Control



using the current source to offset the current detection level.

During start, R5-C2 time constant keeps current source off and level for current limit is 20A (200mV). Once C2 is charged to high level, it turns on the current source offsetting the current limit to 10A (100mV). Furthermore, if pin 2 (current generator control) is connected on the power line output (3.3V) and if a short circuit occurs, the TSM101 latches and the output remains low, needing a system restart.

2 - Dual Overvoltage Controller

In two outputs high current power supply like 5V and 12V for PC, the SMPS needs to protect the load against overvoltage. The TSM101 in Figure 2a is detecting any overvoltage on any of both output, informing the system with an ored Power Good output.

Threshold voltages are 11.1V for the 12V and 4.6V for the 5V.

This applies to split power supply as shown in Figure 2b.

3 - Over and Undervoltage control

The TSM101 can be used as a window comparator. This allows to check that each output of the SMPS is in the desired voltage range.

The application diagram is given in figure 3, where the voltage across R2 fixes the good voltage window. In the example, the voltage across R2 gives a 1.2V good voltage window at 12V level, from 11.5V to 12.5V. For any other output voltage, TSM101 output will be low.

Figure 1b : Inrush Current and Latch on SC

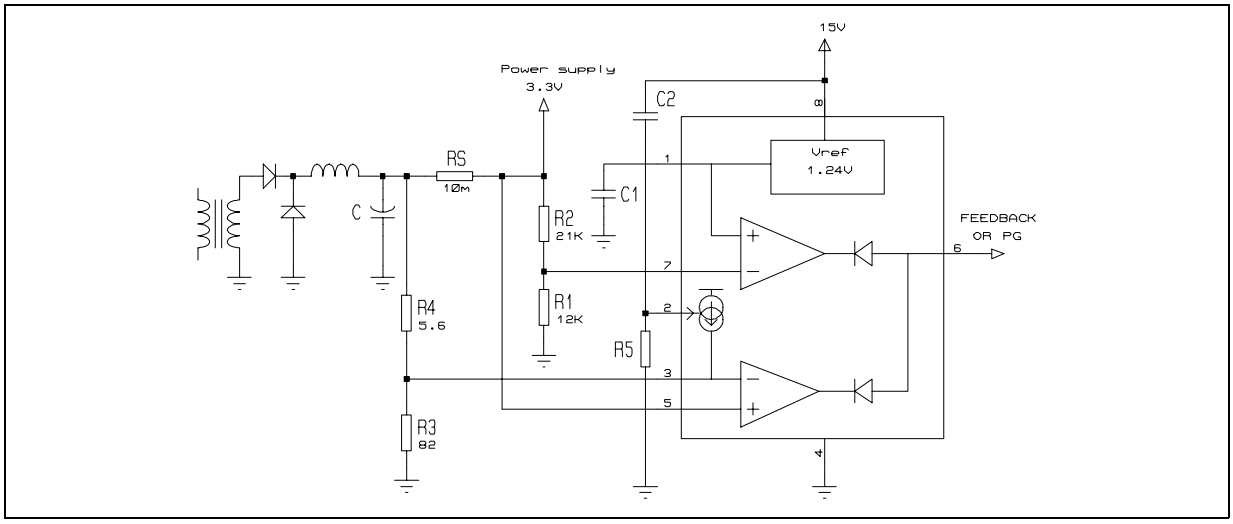
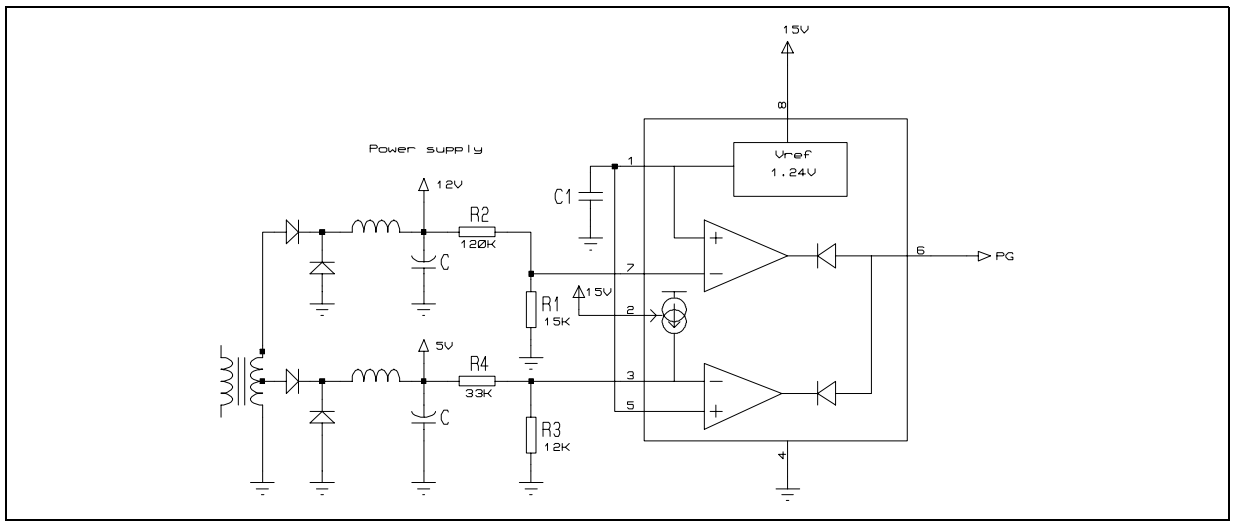


Figure 2a : Overvoltage Detector



Inverting input (7) and non inverting input (5) are respectively used for overvoltage and undervoltage detection.

4 - Other informations

The TSM101 is supplied under 15V in all these applications, referring to the specification values.

In most of applications, TSM101 can be supplied under 4.5V.

TSM101 is available with voltage reference accuracy of 2% and 1% for the "A" version. Compared to market standard TL431, TSM101 has better accuracy in line regulation and load regulation (due to the IC structure).

Figure 2b : Split Supply Overvoltage Detector

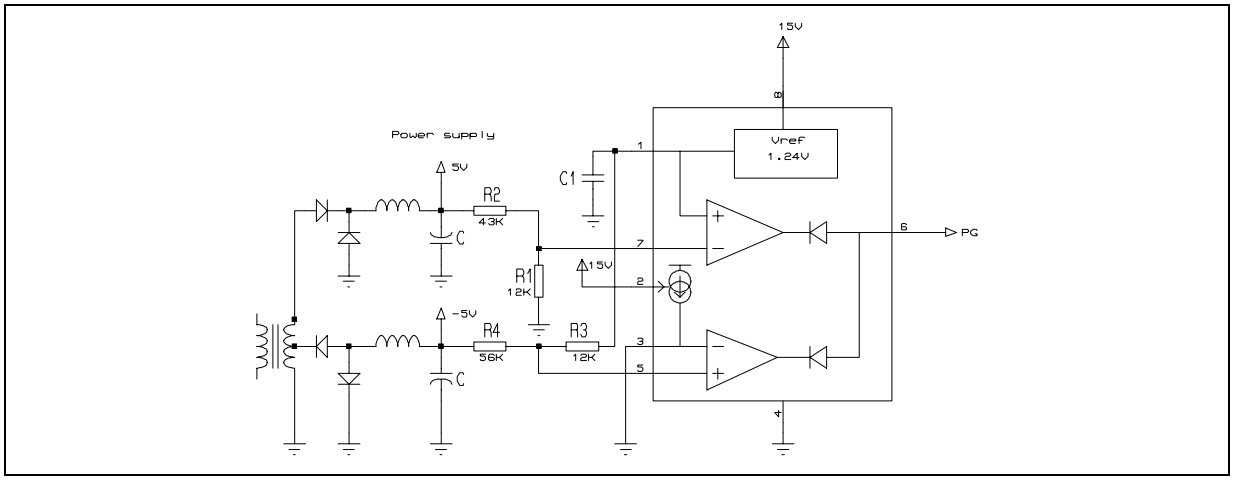
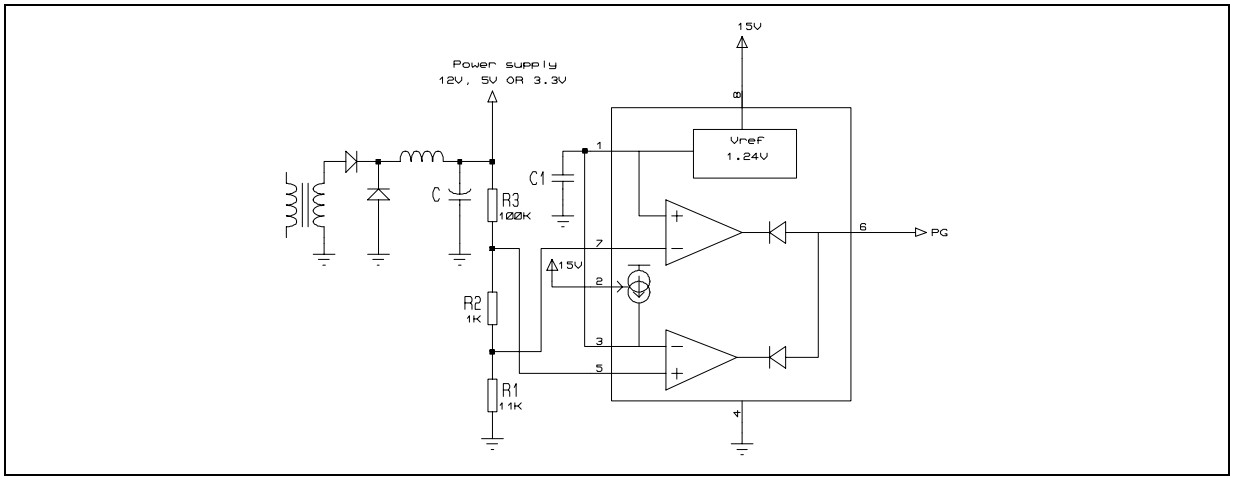


Figure 3 : Over and Undervoltage Detector



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